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OFFICE
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TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER	
32860-000183	
U.S. APPLICATION NO. (If known, see 37 CFR 1.5)	
10/069189	

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/DE00/01104	April 10, 2000	April 22, 1999

TITLE OF INVENTION
METHOD OF KEEPING A CHECK ON THE COSTS ARISING DURING THE OPERATION OF AN INSTALLATION

APPLICANT(S) FOR DO/EO/US
Andreas KOCHENBURGER

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39 (1).
4. ☒ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau). WO 00/65495
   b. ☒ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
   a. ☒ is transmitted herewith.
   b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4)
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)).
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☒ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 20. below concern document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98-1449 and International Search Report (PCT/ISA/210) in German with Three (3) references.
12. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A FIRST preliminary amendment.
14. ☐ A SECOND or SUBSEQUENT preliminary amendment.
15. ☒ A substitute specification.
16. ☒ A change of power of attorney and/or address letter.
17. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821-1.825.
18. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
19. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
20. ☒ Other items or information:
    1) TWO (2) sheets of Formal Drawings

U.S. APPLICATION NO (if known, see 37 CFR 1.5)	INTERNATIONAL APPLICATION NO	ATTORNEY'S DOCKET NUMBER
10/069189 NEW	PCT/DE00/01104	32860-000183

21. ☒ The following fees are submitted:		CALCULATIONS	PTO USE ONLY
BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(5):			
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO.	**$1,040.00**		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO	**$890.00**		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO.	**$710.00**		
International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4)	**$690.00**		
International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4).	**$100.00**		
ENTER APPROPRIATE BASIC FEE AMOUNT =		$ **890.00**	
Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(e)).		$	

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total Claims	20 - 20 =		X **$18.00**	$	
Independent Claims	- 3 =		X **$80.00**	$	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ **$270.00**	$	
			TOTAL OF ABOVE CALCULATIONS =	$ **890.00**	
☐ Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.				$	
			SUBTOTAL =	$ **890.00**	
Processing fee of **$130.00** for furnishing the English translation later than ☐20 ☐30 months from the earliest claimed priority date (37 CFR 1.492(f)).			+	$	
			TOTAL NATIONAL FEE =	$ **890.00**	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property			+	$ **40.00**	
			TOTAL FEES ENCLOSED =	$ **930.00**	
			Amount to be: refunded	$	
			charged	$	

a. ☐ A check in the amount of $ _____ to cover the above fees is enclosed.

b. ☒ Please charge my Deposit Account. No. 08-0750 in the amount of $930.00 to cover the above fees. A triplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 08-0750.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

Send all correspondence to:
Harness, Dickey & Pierce, P.L.C – Customer No. 30596
Post Office Box 8910
Reston, Virginia 20195

Date: October 22, 2001

By _____
Donald J. Daley, #34,313

/kna

PATENT
32860-000183

IN THE U.S. PATENT AND TRADEMARK OFFICE

Applicant: Andreas KOCHENBURGER

Application No.: **NEW**

Filed: October 22, 2001

For: METHOD OF KEEPING A CHECK ON THE COSTS ARISING DURING THE OPERATION OF AN INSTALLATION

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, DC 20231

October 22, 2001

Sir:

The following preliminary amendments and remarks are respectfully submitted in connection with the above-identified application.

IN THE ABSTRACT

Please replace the Abstract with the attached revised Abstract.

IN THE SPECIFICATION

Please replace the original specification with the Substitute Specification attached hereto.

IN THE CLAIMS

Please replace the original claims with the following new claims:

1. (Amended) A method of keeping a check on costs arising during the operation of an installation, comprising:

recording, by a status message, the operating state of least one component of the installation;

feeding the status message to a computer model of the installation;

determining, by the computer module, the actual cost values arising in at least one component of the installation, taking into account earnings from delivery of a final product;

comparing the determined actual cost values with predeterminable set values for costs; and

indicating a deviation between actual values and set values.

2. (Amended) The method as claimed in claim 1, wherein, when determining the actual cost values, an expenditure on basic operating materials is taken into account.

3. (Amended) The method as claimed in claim 1, wherein, when determining the actual cost values, the expenditure on the installation is taken into account.

4. (Amended) The method as claimed in claim 1, further comprising:

outputting a warning if a predeterminable deviation of the actual cost values from the set values is exceeded.

5. (Amended) The method as claimed in claim 1, further comprising:

requesting a manual input if a predeterminable deviation of the actual cost values from the set values is exceeded.

6. (Amended) The method as claimed in claim 1, further comprising:

outputting a request to check the component with the deviation if a predeterminable deviation of the actual cost values from the set values is exceeded.

7. (Amended) The method as claimed in claim 1, further comprising:

feeding at least one of the status messages and computational results of the computer model to a proposals system for automatically determining at least one proposal for improving cost-effectiveness of the installation.

8. (Amended) The method as claimed in claim 7, wherein the determination of the at least one proposal is at least one of shown on a display and transmitted to a higher-level system.

9. (Amended) The method as claimed in claim 1, wherein the operation of the installation is monitored by a separate process control system.

10. (Amended) The method as claimed in claim 9, wherein the status messages are transmitted to the process control system and the status messages are transmitted from the process control system to the computer model.

Please add the following new claims:

-- 11. The method as claimed in claim 2, wherein, when determining the actual cost values, the expenditure on the installation is taken into account.

12. The method of claim 1, wherein the installation is an installation for converting fossil fuels into energy.

13. The method as claimed in claim 12, wherein, when determining the actual cost values, an expenditure on the fuel is taken into account.

14. The method of claim 1, wherein the expenditure includes at least one of depreciation, consumption and maintenance.

15. The method of claim 13, wherein the expenditure includes at least one of depreciation, consumption and maintenance.

16. The method as claimed in claim 13, further comprising:

outputting a warning if a predeterminable deviation of the actual cost values from the set values is exceeded.

17. The method as claimed in claim 13, further comprising:

requesting a manual input if a predeterminable deviation of the actual cost values from the set values is exceeded.

18. The method as claimed in claim 13, further comprising:

outputting a request to check the component with the deviation if a predeterminable deviation of the actual cost values from the set values is exceeded.

19. The method as claimed in claim 13, further comprising:

feeding at least one of the status messages and computational results of the computer model to a proposals system for automatically determining at least one proposal for improving cost-effectiveness of the installation.

20. The method as claimed in claim 13, wherein the operation of the installation is monitored by a separate process control system. --

REMARKS

Claims 1-20 are now present in this application, with new claims 11-20 being added by the present Preliminary Amendment. It should be noted that the amendments to original claims 1-10 of the present application are non-narrowing amendments, made solely to place the claims in proper form for U.S. practice and not to overcome any prior art or for any other statutory considerations. For example, amendments have been made to broaden the claims; remove reference numerals in the claims; remove the European phrase "characterized in that";

remove multiple dependencies in the claims; and to place claims in a more recognizable U.S. form, including the use of the transitional phrase "comprising" as well as the phrase "wherein". Other such non-narrowing amendments include changing the phrase "and/or" to --at least one of--, and reorganizing method claims (separate clauses beginning with "-ing" verbs) in a more recognizable U.S. form. Again, all amendments are non-narrowing and have been made solely to place the claims in proper form for U.S. practice and not to overcome any prior art or for any other statutory considerations.

SUBSTITUTE SPECIFICATION

In accordance with 37 C.F.R. §1.125, a substitute specification has been included in lieu of substitute paragraphs in connection with the present Preliminary Amendment. The substitute specification is submitted in clean form, attached hereto, and is accompanied by a marked-up version showing the changes made to the original specification. The changes have been made in an effort to place the specification in better form for U.S. practice. No new matter has been added by these changes to the specification. Further, the substitute specification includes paragraph numbers to facilitate amendment practice as requested by the U.S. Patent and Trademark Office.

CONCLUSION

Accordingly, in view of the above amendments and remarks, an early indication of the allowability of each of claims 1-20 in connection with the present application is earnestly solicited.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Donald J. Daley at the telephone number of the undersigned below.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 08-0750 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

HARNESS, DICKEY & PIERCE, P.L.C

By: _____
Donald J. Daley, Reg. No. 34,313

DJD:kna

P.O. Box 8910
Reston, Virginia 20195
(703) 390-3030

ABSTRACT OF THE DISCLOSURE

A method of keeping a check on the costs arising during the operation of an installation involves recording the operating state of least one component of the installation by use of a status message. This status message is fed to a computer model of the installation, in which the actual cost values arising are determined and compared with predeterminable set values. The deviation between actual values and set values is then indicated.

2/prts

SUBSTITUTE SPECIFICATION

METHOD OF KEEPING A CHECK ON THE COSTS ARISING DURING THE OPERATION OF AN INSTALLATION

[0001] This application is the national phase under 35 U.S.C. § 371 of PCT International Application No. PCT/DE00/01104 which has an International filing date of April 10, 2000, which designated the United States of America, the entire contents of which are hereby incorporated by reference.

Field of the Invention

[0002] The present invention generally relates to a method of keeping a check on the costs arising during the operation of an installation. In particular, it relates to an installation for converting fossil fuels into energy, the operating state of least one component of the installation being recorded by means of a status message.

Background of the Invention

[0003] In known installations, for example energy generating installations, a process control system (PCS) is used for controlling and monitoring the conversion of fossil fuel into energy, in particular electric power and/or heat. This PCS provides information on the current state of individual components of the installation and the conversion process taking place. However, for the operator of the installation, the conversion process in itself is, from a commercial viewpoint, only an intermediate step toward the final product, for example electrical energy. It is disadvantageous in particular to a known PCS that only installation-specific warnings are output, for example when certain limit values for temperature or pressure are exceeded. No warning is given to avoid unnecessary costs. Rather, certain parameters which are to be maintained during operation are predetermined during the design of the installation. It is not possible for any actual direct check to be kept on costs when the installation is running.

SUMMARY OF THE INVENTION

[0004] It is therefore the object of the present invention to provide a method by which a check can be kept on the operating costs during the operation of an installation.

[0005] This object is achieved according to the invention in the case of a method of the type stated at the beginning by the status message being fed to a computer model of the installation, the actual cost values arising in one or more components of the installation are

determined by the computer model and compared with predeterminable set values for the costs and the deviation between actual values and set values is indicated.

[0006] The status messages of individual components permit a calculation of the actual cost values arising in the components and of the overall costs of the installation. When determining the actual cost values, the earnings from the delivery of the final product, in particular energy, are taken into account. Consequently, from a commercial viewpoint, not only the expenditure arising but also the earnings realized are taken into account. In individual cases, operation of the installation under conditions which are not ideal, causing greater expenditure, may be justified by increased earnings. The calculated actual cost values are compared with theoretically determined set values and the deviation is indicated. As a result, a check on the costs arising is achieved independently of the conversion process actually taking place. At the same time, information on the cost-effectiveness of the installation is provided by the comparison of the actual cost values with the set values. Status messages in the sense of the invention may in this case be analog and binary measured variables and derived status signals from parts of the installation and components.

[0007] Advantageous configurations and developments of the invention emerge from the dependent claims.

[0008] In a first advantageous configuration, when determining the actual cost values, the expenditure on basic operating materials, in particular the fuel, is taken into account. This expenditure provides information on the actual, directly operation-related financial investment.

[0009] According to a second advantageous configuration, when determining the actual cost values, the expenditure on the installation, in particular for depreciation, own consumption, personnel and/or maintenance, is taken into account. As a result, along with the expenditure on fuel, the wear and tear of the installation and the components, payroll costs and other regular expenses are also included. The computer model then identifies less demanding operation of the installation, which for example reduces the depreciation or extends the maintenance intervals. In spite of possibly higher fuel expenditure, altogether lower operating costs can be achieved.

[0010] If a predeterminable deviation of the actual cost values from the set values is exceeded, a warning is advantageously output. This warning makes the operating personnel aware of the situation and draws their attention to uneconomical operation of the installation. The cost consciousness of the operating personnel is therefore significantly improved.

[0011] According to an advantageous development, if a predeterminable deviation of the actual cost values from the set values is exceeded, a manual input by a user is requested. The manual input serves as confirmation that the uneconomical operation is actually intended, for

example for purposes of testing the installation. This input further improves once again the cost consciousness of the operating personnel.

[0012] In an advantageous configuration, if a predeterminable deviation of the actual cost values from the set values is exceeded, a request to check the component with the deviation is output. The method according to the invention not only indicates increased costs, but also provides solution proposals for reducing costs. The corresponding technical information can be input into the computer model and taken into account in the simulation of the conversion process. Malfunctions of the installation can be quickly identified and eliminated.

[0013] The status messages and/or computational results of the computer model may be fed to a proposals system for automatically determining one or more proposals for improving the cost-effectiveness of the installation. In particular, it is possible to determine proposals which suggest continued operation of the installation in spite of a deterioration in one or more cost items with regard to the cost-effectiveness of the overall installation or to determine proposals which advise a need for indirect or direct action, for example maintenance to be carried out.

[0014] This configuration permits a combination of the status messages received in relation to the individual components. Since the components are interconnected by the process taking place in the installation, it can be assumed that the operating state of an upstream component influences the operating state of a downstream component. Combining the individual status messages with one another has the effect that such interactions between the individual components are reliably detected and instances of misdiagnosis are avoided. As an alternative or in addition to the status messages, computational results of the computer module may also be used.

[0015] According to an advantageous development, the determination of the proposal or proposals is optically and/or acoustically shown on a display and/or transmitted to a higher-level system. As a result, the attention of the operating personnel is drawn to proposals determined by the proposals system. The transmission to a higher-level system permits a central data acquisition and administration for installations spatially separated from one another.

[0016] The operation of the installation is advantageously monitored by a separate process control system. The computer model runs independently of the installation and does not independently intervene in the operation of the installation. As a result, reliable operation of the installation is ensured. Furthermore, the method according to the invention can be retrospectively implemented in existing installations.

[0017] According to an advantageous development, the status messages are transmitted to the process control system and from there to the computer model. The status messages recorded in already existing installations are generally adequate for the computer model. Additional measuring instruments are not required, with the result that the computer model can be retrospectively implemented with minimal expense.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] The invention is described in more detail below on the basis of an exemplary embodiment, which is represented in a schematic way in the drawing, in which:

Figure 1 shows a schematic representation of an installation and of a conversion process;

Figure 2 shows a flow diagram of the method according to the invention; and

Figure 3 shows a flow diagram of the automatic creation of proposals.

DETAILED DESCRIPTION OF THE PREFERRED EMODIMENTS

[0019] Figure 1 shows by way of example a schematic representation of an installation 10 for the conversion of a fossil fuel 13 into energy 15. The installation 10 comprises a series of different components 11.1, 11.2, ..., 11.6. The fuel 13 is fed to the installation 10 in the direction of the arrow 14. In the installation 10, a conversion process takes place, in which the fuel 13 is converted by the components 11.1, 11.2, ..., 11.6 into energy 15. The energy is delivered in the direction of the arrow 16 to consumers, not represented in any more detail for the sake of brevity.

[0020] For monitoring and controlling, or automatically controlling, the installation 10 and its components 11.1, 11.2, ..., 11.6 and also the conversion process, a process control system (PCS) 18 is provided. The operating state of the components 11.1, 11.2, ..., 11.6 is reported to the PCS 18 by means of status messages 17.1, 17.2, ..., 17.6. The PCS 18 is connected to an input and output unit 19 for displaying the operating state and for the input of commands.

[0021] According to the invention, a computer model 20 of the installation 10 is provided in addition to the PCS 18. Like the PCS, the computer model 20 is connected to an input and output unit 21. It includes a theoretical model of the installation 10 and its components 11.1, 11.2, ..., 11.6 and determines the costs arising in the components 11.1, 11.2, ..., 11.6 and also the overall costs of the installation 10. The required information is supplied by the PCS 18 to the computer model 20, as schematically represented by the arrow 22. Therefore, dedicated measuring instruments are generally not required for the operation of the computer model 20. Depending on the embodiment, the computer model 20 may also transmit information back to the PCS 18.

[0022] In the embodiment according to the invention as shown in figure 1, a proposals system 25 is also provided. The status messages 17.1, 17.2, ..., 17.6 and/or computational results of the computer model 20 are fed to this proposals system 25, as indicated by the arrow 26. On the basis of the status messages 17.1, 17.2, ..., 17.6 and/or the computational results, the proposals system 25 determines one or more proposals for improving the cost-effectiveness of the installation 10. These proposals are passed on to the input and output module 21, as represented by the arrow 27.

[0023] To increase accuracy, it is possible for not only current information on the operating state of this type of the installation 10 to be used but also predicted information.

[0024] Figure 2 shows a flow diagram of the method according to the invention. In step I, the operating state of the components 11.1, 11.2, ..., 11.6 is recorded by means of status messages 17.1, 17.2, ..., 17.6. These status messages 17.1, 17.2, ..., 17.6 are transmitted in step II to the computer model 20. According to step III, the computer model 20 determines the actual costs arising in the individual components 11.1, 11.2, ..., 11.6. In step IV, the determined actual costs are compared with the predetermined set values for the costs. If the difference is less than a predetermined deviation, this is transmitted to a display 23 according to branch 1. This display 23 may be integrated into the input and output module 21 or be fed to the input and output module 19 via the PCS 18. In the event of relatively great differences, a warning requesting acknowledgement 24 is output, according to branch 0. A request for testing may be output together with the warning.

[0025] When the costs are determined in step III, different influences can be taken into account. According to step A, the expenditure on the fuel 13 is taken into account. In step B, the expenditure on the installation 10, such as maintenance, depreciation, own consumption, personnel, etc., is additionally taken into account. Step C permits the inclusion of the earnings achieved by the delivery of the energy 15. Consequently, all the commercial factors of the earnings side and expenditure side can be taken into account in the computer model 20.

[0026] Figure 3 shows a flow diagram for the automatic creation of proposals according to the proposals system 25. Firstly, in step VI, the status messages 17 received by the computer model 20 and possibly further values are compared with reference patterns stored in advance. These reference patterns are stored installation-specifically for different operating states. Subsequently, in step VII, the proposals system 25 carries out a comparison between the reference patterns and the information received. If, in this comparison, no coincidence is established, a return is made to step VI according to branch zero. If the proposals system 25 establishes a certain quality of coincidence, the next reference pattern is selected according to branch 1 in step VIII and the corresponding proposal or proposals is or are output. The output may take place either on the input and output module 21, as represented in figure 1.

Alternatively, output on the input and output module 19 of the PCS 18 is of course also possible. The determination and output of the proposal or proposals are displayed optically and/or acoustically and the attention of the operating personnel is aroused here by. As an alternative or in addition, according to step IX, a report may be prepared and stored. Thereafter, in step X, it is transmitted to a higher-level system, such as for example a PC network or production-management system, for further handling.

[0027] The proposals created by the proposals system 25 can be selected from a set of installation-specific preprogrammed directions for action to the operating personnel. They may, however, also contain automatically generated information, such as the information code of the component 11.1, 11.2, ..., 11.6 concerned of the installation 10, current and theoretically achievable operating parameters and also the status message 17.1, 17.2, ..., 17.6.

[0028] Combining the individual status messages 17.1, 17.2, ..., 17.6 with one another and possibly adding further computational results of the computer model 20 has the effect of creating a reliable picture of the installation 10. This picture takes into account that the components 11.1, 11.2, ..., 11.6 of the installation 10 influence one another. An unsatisfactory operating state of the components 11.6 does not necessarily have to be attributable to a fault of the component 11.6, but may also be caused by the upstream components 11.1, 11.2, ..., 11.5. Such states of the installation 10 are reliably avoided by combining the individual status messages 17.1, 17.2, ..., 17.6 with one another.

[0029] If, for example, a deterioration in the logarithmic mean temperature difference (LMTD) of the cooling water at the condenser of a power plant is detected, the proposal to clean the main condenser at the next opportunity is created. The proposals system 25 at the same time takes the next planned installation shutdown into account here and determines whether it is commercially more advisable for the installation 10 to be shut down immediately and cleaned immediately or to be operated in a state which is not ideal. The proposal made by the proposals system 25 is generated on the basis of its high commercial improvement potential, since a poor LMTD is an indication of a poor vacuum of the main condenser and consequently of a deteriorated overall level of efficiency of the installation 10.

[0030] Major deviations of the calculated actual costs from the predetermined set values are displayed on the input and output module 21 and require an acknowledgement by the operating personnel. As a result, not only is a check kept on the costs while the installation 10 is in operation, but the cost consciousness of the operating personnel is also significantly improved.

[0031] The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all such modifications as would be obvious to one skilled in the art are intended to be included within the scope of the following claims.

Description

Method of keeping a check on the costs arising during the operation of an installation

FIELD OF THE INVENTION

The present invention generally relates to a method of keeping a check on the costs arising during the operation of an installation. In particular, it relates to an installation for converting fossil fuels into energy, the operating state of least one component of the installation being recorded by means of a status message.

BACKGROUND OF THE INVENTION

In known installations, for example energy generating installations, a process control system (PCS) is used for controlling and monitoring the conversion of fossil fuel into energy, in particular electric power and/or heat. This PCS provides information on the current state of individual components of the installation and the conversion process taking place. However, for the operator of the installation, the conversion process in itself is, from a commercial viewpoint, only an intermediate step toward the final product, for example electrical energy. It is disadvantageous in particular to a known PCS that only installation-specific warnings are output, for example when certain limit values for temperature or pressure are exceeded. No warning is given to avoid unnecessary costs. Rather, certain parameters which are to be maintained during operation are predetermined during the design of the installation. It is not possible for any actual direct check to be kept on costs when the installation is running.

SUMMARY OF THE INVENTION

It is therefore the object of the present invention to provide a method by which a check can be kept on the operating costs during the operation of an installation.

This object is achieved according to the invention in the case of a method of the type stated at the beginning by the status message being fed to a computer model of the installation,

the actual cost values arising in one or more components of the installation are determined by the computer model and compared with predeterminable set values for the costs and the deviation between actual values and set values is indicated.

The status messages of individual components permit a calculation of the actual cost values arising in the components and of the overall costs of the installation. When determining the actual cost values, the earnings from the delivery of the final product, in particular energy, are taken into account. Consequently, from a commercial viewpoint, not only the expenditure arising but also the earnings realized are taken into account. In individual cases, operation of the installation under conditions which are not ideal, causing greater expenditure, may be justified by increased earnings. The calculated actual cost values are compared with theoretically determined set values and the deviation is indicated. As a result, a check on the costs arising is achieved independently of the conversion process actually taking place. At the same time, information on the cost-effectiveness of the installation is provided by the comparison of the actual cost values with the set values. Status messages in the sense of the invention may in this case be analog and binary measured variables and derived status signals from parts of the installation and components.

Advantageous configurations and developments of the invention emerge from the dependent claims.

In a first advantageous configuration, when determining the actual cost values, the expenditure on basic operating materials, in particular the fuel, is taken into account. This expenditure provides information on

the actual, directly operation-related financial investment.

According to a second advantageous configuration, when determining the actual cost values, the expenditure on the installation, in particular for depreciation, own consumption, personnel and/or maintenance, is taken into account. As a result, along with the expenditure on fuel, the wear and tear of the installation and the components, payroll costs and other regular expenses are also included. The computer model then identifies less demanding operation of the installation, which for example reduces the depreciation or extends the maintenance intervals. In spite of possibly higher fuel expenditure, altogether lower operating costs can be achieved.

If a predeterminable deviation of the actual cost values from the set values is exceeded, a warning is advantageously output. This warning makes the operating personnel aware of the situation and draws their attention to uneconomical operation of the installation. The cost consciousness of the operating personnel is therefore significantly improved.

According to an advantageous development, if a predeterminable deviation of the actual cost values from the set values is exceeded, a manual input by a user is requested. The manual input serves as confirmation that the uneconomical operation is actually intended, for example for purposes of testing the installation. This input further improves once again the cost consciousness of the operating personnel.

In an advantageous configuration, if a predeterminable deviation of the actual cost values from the set values is exceeded, a request to check the component with the deviation is output. The method according to the invention not only indicates increased costs, but also provides solution proposals for reducing costs. The

corresponding technical information can be input into the computer model and taken into account in the simulation of the conversion process.

Malfunctions of the installation can be quickly identified and eliminated.

The status messages and/or computational results of the computer model may be fed to a proposals system for automatically determining one or more proposals for improving the cost-effectiveness of the installation. In particular, it is possible to determine proposals which suggest continued operation of the installation in spite of a deterioration in one or more cost items with regard to the cost-effectiveness of the overall installation or to determine proposals which advise a need for indirect or direct action, for example maintenance to be carried out.

This configuration permits a combination of the status messages received in relation to the individual components. Since the components are interconnected by the process taking place in the installation, it can be assumed that the operating state of an upstream component influences the operating state of a downstream component. Combining the individual status messages with one another has the effect that such interactions between the individual components are reliably detected and instances of misdiagnosis are avoided. As an alternative or in addition to the status messages, computational results of the computer module may also be used.

According to an advantageous development, the determination of the proposal or proposals is optically and/or acoustically shown on a display and/or transmitted to a higher-level system. As a result, the attention of the operating personnel is drawn to proposals determined by the proposals system. The transmission to a higher-level system permits a central data acquisition and administration for installations spatially separated from one another.

The operation of the installation is advantageously monitored by a separate process control system. The computer model runs independently of the installation and does not independently intervene in the operation of the installation. As a result, reliable operation of the installation is ensured. Furthermore, the method according to the invention can be retrospectively implemented in existing installations.

According to an advantageous development, the status messages are transmitted to the process control system and from there to the computer model. The status messages recorded in already existing installations are generally adequate for the computer model. Additional measuring instruments are not required, with the result that the computer model can be retrospectively implemented with minimal expense.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is described in more detail below on the basis of an exemplary embodiment, which is represented in a schematic way in the drawing, in which:

figure 1 shows a schematic representation of an installation and of a conversion process;

figure 2 shows a flow diagram of the method according to the invention; and

figure 3 shows a flow diagram of the automatic creation of proposals.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figure 1 shows by way of example a schematic representation of an installation 10 for the conversion of a fossil fuel 13 into energy 15. The installation 10 comprises a series of different components 11.1, 11.2, ..., 11.6. The fuel 13 is fed to the installation 10 in the direction of the arrow 14. In the installation 10, a conversion process takes place, in which the fuel 13 is converted by ~~means of~~ the components 11.1, 11.2, ..., 11.6 into energy 15. The

energy is delivered in the direction of the arrow 16 to consumers, not represented in any more detail. for the sake of brevity

For monitoring and controlling, or automatically controlling, the installation 10 and its components 11.1, 11.2, ..., 11.6 and also the conversion process, a process control system (PCS) 18 is provided. The operating state of the components 11.1, 11.2, ..., 11.6 is reported to the PCS 18 by means of status messages 17.1, 17.2, ..., 17.6. The PCS 18 is connected to an input and output unit 19 for displaying the operating state and for the input of commands.

According to the invention, a computer model 20 of the installation 10 is provided in addition to the PCS 18. Like the PCS, the computer model 20 is connected to an input and output unit 21. It ~~comprises~~ includes a theoretical model of the installation 10 and its components 11.1, 11.2, ..., 11.6 and determines the costs arising in the components 11.1, 11.2, ..., 11.6 and also the overall costs of the installation 10. The required information is supplied by the PCS 18 to the computer model 20, as schematically represented by the arrow 22. Therefore, dedicated measuring instruments are generally not required for the operation of the computer model 20. Depending on the embodiment, the computer model 20 may also transmit information back to the PCS 18.

In the embodiment according to the invention as shown in figure 1, a proposals system 25 is also provided. The status messages 17.1, 17.2, ..., 17.6 and/or computational results of the computer model 20 are fed to this proposals system 25, as indicated by the arrow 26. On the basis of the status messages 17.1, 17.2, ..., 17.6 and/or the computational results, the proposals system 25 determines one or more proposals for improving the cost-effectiveness of the installation 10. These proposals are passed on to the input and output module 21, as represented by the arrow 27.

To increase accuracy, it is possible for not only current information on the operating state of this type of the installation 10 to be used but also predicted information.

Figure 2 shows a flow diagram of the method according to the invention. In step I, the operating state of the components 11.1, 11.2, ..., 11.6 is recorded by means of status messages 17.1, 17.2, ..., 17.6. These status messages 17.1, 17.2, ..., 17.6 are transmitted in step II to the computer model 20. According to step III, the computer model 20 determines the actual costs arising in the individual components 11.1, 11.2, ..., 11.6. In step IV, the determined actual costs are compared with the predetermined set values for the costs. If the difference is less than a predetermined deviation, this is transmitted to a display 23 according to branch 1. This display 23 may be integrated into the input and output module 21 or be fed to the input and output module 19 via the PCS 18. In the event of relatively great differences, a warning requesting acknowledgement 24 is output, according to branch 0. A request for testing may be output together with the warning.

When the costs are determined in step III, different influences can be taken into account. According to step A, the expenditure on the fuel 13 is taken into account. In step B, the expenditure on the installation 10, such as maintenance, depreciation, own consumption, personnel, etc., is additionally taken into account. Step C permits the inclusion of the earnings achieved by the delivery of the energy 15. Consequently, all the commercial factors of the earnings side and expenditure side can be taken into account in the computer model 20.

Figure 3 shows a flow diagram for the automatic creation of proposals according to the proposals system 25. Firstly, in step VI, the status messages 17 received by the computer model 20 and possibly further values are compared with reference patterns stored in advance. These reference patterns are stored

installation-specifically for different operating states. Subsequently, in step VII, the proposals system 25 carries out a comparison between the reference patterns and the information received. If, in this comparison,

no coincidence is established, a return is made to step VI according to branch zero. If the proposals system 25 establishes a certain quality of coincidence, the next reference pattern is selected according to branch 1 in step VIII and the corresponding proposal or proposals is or are output. The output may take place either on the input and output module 21, as represented in figure 1. Alternatively, output on the input and output module 19 of the PCS 18 is of course also possible. The determination and output of the proposal or proposals are displayed optically ~~or~~ and/or acoustically and the attention of the operating personnel is aroused here by. As an alternative or in addition, according to step IX, a report may be prepared and stored, ~~and~~ thereafter, in step X, it is transmitted to a higher-level system, such as for example a PC network or production-management system, for further handling.

The proposals created by the proposals system 25 can be selected from a set of installation-specific preprogrammed directions for action to the operating personnel. They may, however, also contain automatically generated information, such as the information code of the component 11.1, 11.2, ..., 11.6 concerned of the installation 10, current and theoretically achievable operating parameters and also the status message 17.1, 17.2, ..., 17.6.

Combining the individual status messages 17.1, 17.2, ..., 17.6 with one another and possibly adding further computational results of the computer model 20 has the effect of creating a reliable picture of the installation 10. This picture takes into account that the components 11.1, 11.2, ..., 11.6 of the installation 10 influence one another. An unsatisfactory operating state of the components 11.6 does not necessarily have to be attributable to a fault of the component 11.6, but may also be caused by the

upstream components 11.1, 11.2, ..., 11.5. Such states of the installation 10 are reliably avoided by combining the

individual status messages 17.1, 17.2, ..., 17.6 with one another.

If, for example, a deterioration in the logarithmic mean temperature difference (LMTD) of the cooling water at the condenser of a power plant is detected, the proposal to clean the main condenser at the next opportunity is created. The proposals system 25 at the same time takes the next planned installation shutdown into account here and determines whether it is commercially more advisable for the installation 10 to be shut down immediately and cleaned immediately or to be operated in a state which is not ideal. The proposal made by the proposals system 25 is generated on the basis of its high commercial improvement potential, since a poor LMTD is an indication of a poor vacuum of the main condenser and consequently of a deteriorated overall level of efficiency of the installation 10.

Major deviations of the calculated actual costs from the predetermined set values are displayed on the input and output module 21 and require an acknowledgement by the operating personnel. As a result, not only is a check kept on the costs while the installation 10 is in operation, but the cost consciousness of the operating personnel is also significantly improved.

VARIATIONS OF

MARKED-UP COPY OF CLAIMS

What is claimed is:

~~Patent claims~~

(Amended)

1. A method of keeping a check on [the] costs arising during the operation of an installation [(10), in particular an installation for converting fossil fuels (13) into energy (15)], comprising: recording, by a status message, [the operating state of] least one component [(11)] of the installation [(10) being recorded by means of a status message (11),]; [characterized in that] feeding the status message [(17) is fed] to a computer model [(20)] of the installation [(10),]; determining, by the computer module, the actual cost values arising in at least one component [one or more components (11)] of the installation [are determined by the computer model (20)], taking into account [the] a earnings from [the] delivery of [the] final product[, in particular the energy (15)]; comparing the determined actual cost values [and] [compared] with predeterminable set values for [the] costs; and [the] indicating a deviation between actual values and set values [is indicated].

(Amended)

2. The method as claimed in claim 1, wherein [characterized in that], when determining the actual cost values, [the] an expenditure on basic operating materials[, in particular the fuel (13),] is taken into account.

(Amended)

3. The method as claimed in claim 1 [or 2], [characterized in that,] wherein when determining the actual cost values, the expenditure on the installation [(10), in particular for depreciation, own consumption, personnel and/or maintenance,] is taken into account.

(Amended)

4. The method as claimed in [one of claims] claim 1 [to 3], further comprising: outputting a warning [characterized in that, if] when a predeterminable deviation of the actual cost values from the set values is exceeded[, a warning is output].

(Amended)

5. The method as claimed in [one of claims] 1 [to 4, characterized in that,] further comprising: requesting a manual input if a predeterminable deviation of the actual cost values

from the set values is exceeded, a manual input by a user is requested.

further comprising: outputting a request to check the component with the deviation

6. (Amended) The method as claimed in one of claims 1 to 5, characterized in that, if a predeterminable deviation of the actual cost values from the set values is exceeded, a request (24) to check the component (11) with the deviation is output.

7. (Amended) The method as claimed in one of claims 1 to 6, further comprising: characterized in that the status messages (17) and/or computational results of the computer model (20) are fed at least one of to a proposals system (25) for automatically determining at least one proposal one or more proposals for improving the cost-effectiveness of the installation (10).

8. (Amended) The method as claimed in claim 7, characterized in that wherein the determination of the at least one proposal or proposals is optically and/or acoustically at least one of shown on a display (21) or and transmitted to a higher-level system.

9. (Amended) The method as claimed in one of claims 1 to 8, characterized in that wherein the operation of the installation (10) is monitored by a separate process control system (18).

10. (Amended) The method as claimed in claim 9, characterized in that wherein the status messages (17) are transmitted to the process control system (18), and from there the status messages are transmitted to the computer model (20).

NEW CLAIMS

11. same as 3, but dep on 2
12. The method of claim 1, wherein the installation is an installation for converting fossil fuels into energy.
13. same as cl. 2, but dep on cl. 12 & change "basic operating materials" to --the fuel--
14. ~~same as cl. 3, but~~ The method of claim 1, wherein the expenditure includes at least one of depreciation, consumption, and maintenance.
15. same as 14, but dep on 13.
16. same as 4, but dep on 13.
17. same as 5, but dep on 13

18. same as 6, but dep on 13
19. " 7, " 13
20. " 9, " 13

MARKED-UP VERSION OF ABSTRACT

GR 99 P 3270 P

Abstract

Method of keeping a check on the costs arising during the operation of an installation

The present invention relates to A a method of keeping a check on the costs arising during the operation of an installation (10). This involves recording the operating state of least one component (11) of the installation (10) by use means of a status message (17). According to the invention, This this status message (17) is fed to a computer model (20) of the installation, in which the actual cost values arising are determined and compared with predeterminable set values. The deviation between actual values and set values is then indicated.

Figure 1

Description

Method of keeping a check on the costs arising during the operation of an installation

The present invention relates to a method of keeping a check on the costs arising during the operation of an installation, in particular an installation for converting fossil fuels into energy, the operating state of least one component of the installation being recorded by means of a status message.

In known installations, for example energy generating installations, a process control system (PCS) is used for controlling and monitoring the conversion of fossil fuel into energy, in particular electric power and/or heat. This PCS provides information on the current state of individual components of the installation and the conversion process taking place. However, for the operator of the installation, the conversion process in itself is, from a commercial viewpoint, only an intermediate step toward the final product, for example electrical energy. It is disadvantageous in particular to a known PCS that only installation-specific warnings are output, for example when certain limit values for temperature or pressure are exceeded. No warning is given to avoid unnecessary costs. Rather, certain parameters which are to be maintained during operation are predetermined during the design of the installation. It is not possible for any actual direct check to be kept on costs when the installation is running.

It is therefore the object of the present invention to provide a method by which a check can be kept on the operating costs during the operation of an installation.

This object is achieved according to the invention in the case of a method of the type stated at the beginning by the status message being fed to a computer model of the installation,

the actual cost values arising in one or more components of the installation are determined by the computer model and compared with predeterminable set values for the costs and the deviation between actual values and set values is indicated.

The status messages of individual components permit a calculation of the actual cost values arising in the components and of the overall costs of the installation. When determining the actual cost values, the earnings from the delivery of the final product, in particular energy, are taken into account. Consequently, from a commercial viewpoint, not only the expenditure arising but also the earnings realized are taken into account. In individual cases, operation of the installation under conditions which are not ideal, causing greater expenditure, may be justified by increased earnings. The calculated actual cost values are compared with theoretically determined set values and the deviation is indicated. As a result, a check on the costs arising is achieved independently of the conversion process actually taking place. At the same time, information on the cost-effectiveness of the installation is provided by the comparison of the actual cost values with the set values. Status messages in the sense of the invention may in this case be analog and binary measured variables and derived status signals from parts of the installation and components.

Advantageous configurations and developments of the invention emerge from the dependent claims.

In a first advantageous configuration, when determining the actual cost values, the expenditure on basic operating materials, in particular the fuel, is taken into account. This expenditure provides information on

the actual, directly operation-related financial investment.

According to a second advantageous configuration, when determining the actual cost values, the expenditure on the installation, in particular for depreciation, own consumption, personnel and/or maintenance, is taken into account. As a result, along with the expenditure on fuel, the wear and tear of the installation and the components, payroll costs and other regular expenses are also included. The computer model then identifies less demanding operation of the installation, which for example reduces the depreciation or extends the maintenance intervals. In spite of possibly higher fuel expenditure, altogether lower operating costs can be achieved.

If a predeterminable deviation of the actual cost values from the set values is exceeded, a warning is advantageously output. This warning makes the operating personnel aware of the situation and draws their attention to uneconomical operation of the installation. The cost consciousness of the operating personnel is therefore significantly improved.

According to an advantageous development, if a predeterminable deviation of the actual cost values from the set values is exceeded, a manual input by a user is requested. The manual input serves as confirmation that the uneconomical operation is actually intended, for example for purposes of testing the installation. This input further improves once again the cost consciousness of the operating personnel.

In an advantageous configuration, if a predeterminable deviation of the actual cost values from the set values is exceeded, a request to check the component with the deviation is output. The method according to the invention not only indicates increased costs, but also provides solution proposals for reducing costs. The

corresponding technical information can be input into the computer model and taken into account in the simulation of the conversion process.

Malfunctions of the installation can be quickly identified and eliminated.

The status messages and/or computational results of the computer model may be fed to a proposals system for automatically determining one or more proposals for improving the cost-effectiveness of the installation; in particular, it is possible to determine proposals which suggest continued operation of the installation in spite of a deterioration in one or more cost items with regard to the cost-effectiveness of the overall installation or to determine proposals which advise a need for indirect or direct action, for example maintenance to be carried out.

This configuration permits a combination of the status messages received in relation to the individual components. Since the components are interconnected by the process taking place in the installation, it can be assumed that the operating state of an upstream component influences the operating state of a downstream component. Combining the individual status messages with one another has the effect that such interactions between the individual components are reliably detected and instances of misdiagnosis are avoided. As an alternative or in addition to the status messages, computational results of the computer module may also be used.

According to an advantageous development, the determination of the proposal or proposals is optically and/or acoustically shown on a display and/or transmitted to a higher-level system. As a result, the attention of the operating personnel is drawn to proposals determined by the proposals system. The transmission to a higher-level system permits a central data acquisition and administration for installations spatially separated from one another.

The operation of the installation is advantageously monitored by a separate process control system. The computer model runs independently of the installation and does not independently intervene in the operation of the installation. As a result, reliable operation of the installation is ensured. Furthermore, the method according to the invention can be retrospectively implemented in existing installations.

According to an advantageous development, the status messages are transmitted to the process control system and from there to the computer model. The status messages recorded in already existing installations are generally adequate for the computer model. Additional measuring instruments are not required, with the result that the computer model can be retrospectively implemented with minimal expense.

The invention is described in more detail below on the basis of an exemplary embodiment, which is represented in a schematic way in the drawing, in which:

figure 1 shows a schematic representation of an installation and of a conversion process;

figure 2 shows a flow diagram of the method according to the invention; and

figure 3 shows a flow diagram of the automatic creation of proposals.

Figure 1 shows by way of example a schematic representation of an installation 10 for the conversion of a fossil fuel 13 into energy 15. The installation 10 comprises a series of different components 11.1, 11.2, ..., 11.6. The fuel 13 is fed to the installation 10 in the direction of the arrow 14. In the installation 10, a conversion process takes place, in which the fuel 13 is converted by means of the components 11.1, 11.2, ..., 11.6 into energy 15. The

energy is delivered in the direction of the arrow 16 to consumers, not represented in any more detail.

For monitoring and controlling, or automatically controlling, the installation 10 and its components 11.1, 11.2, ..., 11.6 and also the conversion process, a process control system (PCS) 18 is provided. The operating state of the components 11.1, 11.2, ..., 11.6 is reported to the PCS 18 by means of status messages 17.1, 17.2, ..., 17.6. The PCS 18 is connected to an input and output unit 19 for displaying the operating state and for the input of commands.

According to the invention, a computer model 20 of the installation 10 is provided in addition to the PCS 18. Like the PCS, the computer model 20 is connected to an input and output unit 21. It comprises a theoretical model of the installation 10 and its components 11.1, 11.2, ..., 11.6 and determines the costs arising in the components 11.1, 11.2, ..., 11.6 and also the overall costs of the installation 10. The required information is supplied by the PCS 18 to the computer model 20, as schematically represented by the arrow 22. Therefore, dedicated measuring instruments are generally not required for the operation of the computer model 20. Depending on the embodiment, the computer model 20 may also transmit information back to the PCS 18.

In the embodiment according to the invention as shown in figure 1, a proposals system 25 is also provided. The status messages 17.1, 17.2, ..., 17.6 and/or computational results of the computer model 20 are fed to this proposals system 25, as indicated by the arrow 26. On the basis of the status messages 17.1, 17.2, ..., 17.6 and/or the computational results, the proposals system 25 determines one or more proposals for improving the cost-effectiveness of the installation 10. These proposals are passed on to the input and output module 21, as represented by the arrow 27.

To increase accuracy, it is possible for not only current information on the operating state of this type of the installation 10 to be used but also predicted information.

Figure 2 shows a flow diagram of the method according to the invention. In step I, the operating state of the components 11.1, 11.2, ..., 11.6 is recorded by means of status messages 17.1, 17.2, ..., 17.6. These status messages 17.1, 17.2, ..., 17.6 are transmitted in step II to the computer model 20. According to step III, the computer model 20 determines the actual costs arising in the individual components 11.1, 11.2, ..., 11.6. In step IV, the determined actual costs are compared with the predetermined set values for the costs. If the difference is less than a predetermined deviation, this is transmitted to a display 23 according to branch 1. This display 23 may be integrated into the input and output module 21 or be fed to the input and output module 19 via the PCS 18. In the event of relatively great differences, a warning requesting acknowledgement 24 is output, according to branch 0. A request for testing may be output together with the warning.

When the costs are determined in step III, different influences can be taken into account. According to step A, the expenditure on the fuel 13 is taken into account. In step B, the expenditure on the installation 10, such as maintenance, depreciation, own consumption, personnel, etc., is additionally taken into account. Step C permits the inclusion of the earnings achieved by the delivery of the energy 15. Consequently, all the commercial factors of the earnings side and expenditure side can be taken into account in the computer model 20.

Figure 3 shows a flow diagram for the automatic creation of proposals according to the proposals system 25. Firstly, in step VI, the status messages 17 received by the computer model 20 and possibly further values are compared with reference patterns stored in advance. These reference patterns are stored

installation-specifically for different operating states. Subsequently, in step VII, the proposals system 25 carries out a comparison between the reference patterns and the information received. If, in this comparison,

no coincidence is established, a return is made to step VI according to branch zero. If the proposals system 25 establishes a certain quality of coincidence, the next reference pattern is selected according to branch 1 in step VIII and the corresponding proposal or proposals is or are output. The output may take place either on the input and output module 21, as represented in figure 1. Alternatively, output on the input and output module 19 of the PCS 18 is of course also possible. The determination and output of the proposal or proposals are displayed optically or/or acoustically and the attention of the operating personnel is aroused here by. As an alternative or in addition, according to step IX, a report may be prepared and stored and, in step X, transmitted to a higher-level system, such as for example a PC network or production-management system, for further handling.

The proposals created by the proposals system 25 can be selected from a set of installation-specific preprogrammed directions for action to the operating personnel. They may, however, also contain automatically generated information, such as the information code of the component 11.1, 11.2, ..., 11.6 concerned of the installation 10, current and theoretically achievable operating parameters and also the status message 17.1, 17.2, ..., 17.6.

Combining the individual status messages 17.1, 17.2, ..., 17.6 with one another and possibly adding further computational results of the computer model 20 has the effect of creating a reliable picture of the installation 10. This picture takes into account that the components 11.1, 11.2, ..., 11.6 of the installation 10 influence one another. An unsatisfactory operating state of the components 11.6 does not necessarily have to be attributable to a fault of the component 11.6, but may also be caused by the

upstream components 11.1, 11.2, ..., 11.5. Such states of the installation 10 are reliably avoided by combining the

individual status messages 17.1, 17.2, ..., 17.6 with one another.

If, for example, a deterioration in the logarithmic mean temperature difference (LMTD) of the cooling water at the condenser of a power plant is detected, the proposal to clean the main condenser at the next opportunity is created. The proposals system 25 at the same time takes the next planned installation shutdown into account here and determines whether it is commercially more advisable for the installation 10 to be shut down immediately and cleaned immediately or to be operated in a state which is not ideal. The proposal made by the proposals system 25 is generated on the basis of its high commercial improvement potential, since a poor LMTD is an indication of a poor vacuum of the main condenser and consequently of a deteriorated overall level of efficiency of the installation 10.

Major deviations of the calculated actual costs from the predetermined set values are displayed on the input and output module 21 and require an acknowledgement by the operating personnel. As a result, not only is a check kept on the costs while the installation 10 is in operation, but the cost consciousness of the operating personnel is also significantly improved.

Patent claims

1. A method of keeping a check on the costs arising during the operation of an installation (10), in particular an installation for converting fossil fuels (13) into energy (15), the operating state of least one component (11) of the installation (10) being recorded by means of a status message (11), characterized in that the status message (17) is fed to a computer model (20) of the installation (10), the actual cost values arising in one or more components (11) of the installation are determined by the computer model (20), taking into account the earnings from the delivery of the final product, in particular the energy (15), and compared with predeterminable set values for the costs and the deviation between actual values and set values is indicated.

2. The method as claimed in claim 1, characterized in that, when determining the actual cost values, the expenditure on basic operating materials, in particular the fuel (13), is taken into account.

3. The method as claimed in claim 1 or 2, characterized in that, when determining the actual cost values, the expenditure on the installation (10), in particular for depreciation, own consumption, personnel and/or maintenance, is taken into account.

4. The method as claimed in one of claims 1 to 3, characterized in that, if a predeterminable deviation of the actual cost values from the set values is exceeded, a warning is output.

5. The method as claimed in one of claims 1 to 4, characterized in that, if a predeterminable deviation of the actual cost values

from the set values is exceeded, a manual input by a user is requested.

6. The method as claimed in one of claims 1 to 5, characterized in that, if a predeterminable deviation of the actual cost values from the set values is exceeded, a request (24) to check the component (11) with the deviation is output.

7. The method as claimed in one of claims 1 to 6, characterized in that the status messages (17) and/or computational results of the computer model (20) are fed to a proposals system (25) for automatically determining one or more proposals for improving the cost-effectiveness of the installation (10).

8. The method as claimed in claim 7, characterized in that the determination of the proposal or proposals is optically and/or acoustically shown on a display (21) or transmitted to a higher-level system.

9. The method as claimed in one of claims 1 to 8, characterized in that the operation of the installation (10) is monitored by a separate process control system (18).

10. The method as claimed in claim 9, characterized in that the status messages (17) are transmitted to the process control system (18) and from there to the computer model (20).

GR 99 P 3270 P

Abstract

Method of keeping a check on the costs arising during the operation of an installation

The present invention relates to a method of keeping a check on the costs arising during the operation of an installation (10). This involves recording the operating state of least one component (11) of the installation (10) by means of a status message (17). According to the invention, this status message (17) is fed to a computer model (20) of the installation, in which the actual cost values arising are determined and compared with predeterminable set values. The deviation between actual values and set values is indicated.

Figure 1

FIG 1

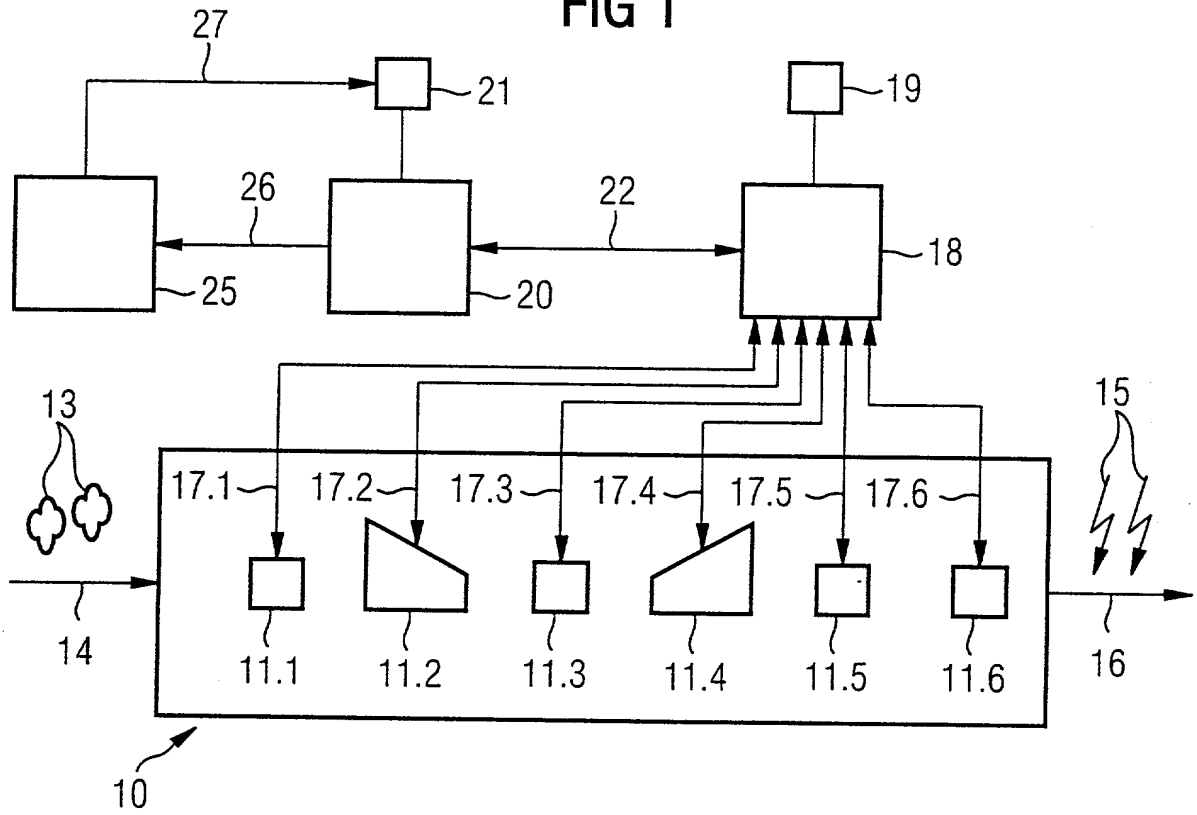

27
21
19
26
22
25
20
18
13
15
17.1
17.2
17.3
17.4
17.5
17.6
14
11.1
11.2
11.3
11.4
11.5
11.6
16
10

FIG 2

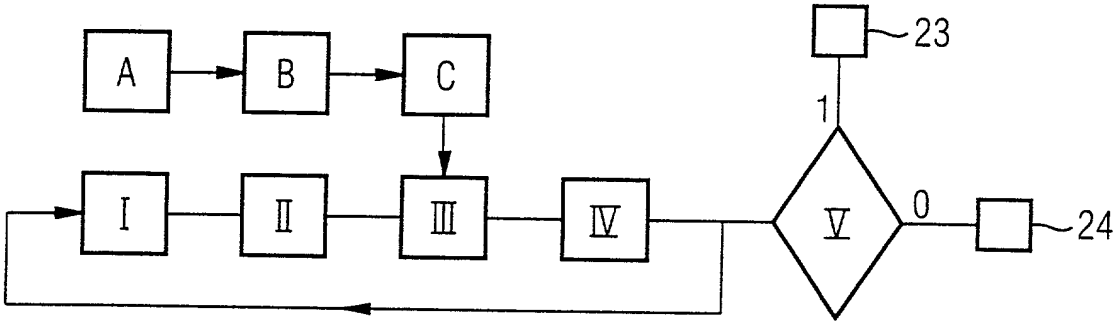
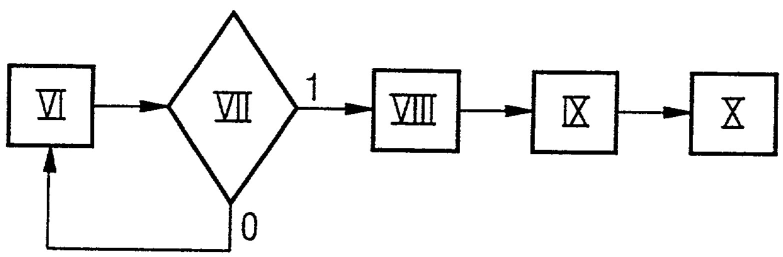

A
B
C
23
1
I
II
III
IV
V
0
24

FIG 3



Declaration and Power of Attorney For Patent Application
Erklärung Für Patentanmeldungen Mit Vollmacht
German Language Declaration

Als nachstehend benannter Erfinder erkläre ich hiermit an Eides Statt:

As a below named inventor, I hereby declare that:

dass mein Wohnsitz, meine Postanschrift, und meine Staatsangehörigkeit den im Nachstehenden nach meinem Namen aufgeführten Angaben entsprechen,

My residence, post office address and citizenship are as stated below next to my name,

dass ich, nach bestem Wissen der ursprüngliche, erste und alleinige Erfinder (falls nachstehend nur ein Name angegeben ist) oder ein ursprünglicher, erster und Miterfinder (falls nachstehend mehrere Namen aufgeführt sind) des Gegenstandes bin, für den dieser Antrag gestellt wird und für den ein Patent beantragt wird für die Erfindung mit dem Titel:

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

Verfahren zur Kontrolle der im Betrieb einer Anlage entstehenden Kosten

Method of controlling the costs arising during operations of an installation

deren Beschreibung

the specification of which

(zutreffendes ankreuzen)
☐ hier beigefügt ist.
☒ am 10.04.2000 als
PCT internationale Anmeldung
PCT Anmeldungsnummer PCT/DE00/01104
eingereicht wurde und am _____
abgeändert wurde (falls tatsächlich abgeändert).

(check one)
☐ is attached hereto.
☒ was filed on 10.04.2000 as
PCT international application
PCT Application No. PCT/DE00/01104
and was amended on _____
(if applicable)

Ich bestätige hiermit, dass ich den Inhalt der obigen Patentanmeldung einschliesslich der Ansprüche durchgesehen und verstanden habe, die eventuell durch einen Zusatzantrag wie oben erwähnt abgeändert wurde.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims as amended by any amendment referred to above.

Ich erkenne meine Pflicht zur Offenbarung irgendwelcher Informationen, die für die Prüfung der vorliegenden Anmeldung in Einklang mit Absatz 37, Bundesgesetzbuch, Paragraph 1.56(a) von Wichtigkeit sind, an.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

Ich beanspruche hiermit ausländische Prioritätsvorteile gemäss Abschnitt 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 119 aller unten angegebenen Auslandsanmeldungen für ein Patent oder eine Erfindersurkunde, und habe auch alle Auslandsanmeldungen für ein Patent oder eine Erfindersurkunde nachstehend gekennzeichnet, die ein Anmeldedatum haben, das vor dem Anmeldedatum der Anmeldung liegt, für die Priorität beansprucht wird.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

German Language Declaration

Prior foreign appplications
Priorität beansprucht

			Priority Claimed	
19918332.5	DE	22.04.1999	☒	☐
(Number)	(Country)	(Day Month Year Filed)	Yes	No
(Nummer)	(Land)	(Tag Monat Jahr eingereicht)	Ja	Nein
			☐	☐
(Number)	(Country)	(Day Month Year Filed)	Yes	No
(Nummer)	(Land)	(Tag Monat Jahr eingereicht)	Ja	Nein
			☐	☐
(Number)	(Country)	(Day Month Year Filed)	Yes	No
(Nummer)	(Land)	(Tag Monat Jahr eingereicht)	Ja	Nein

Ich beanspruche hiermit gemäss Absatz 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 120, den Vorzug aller unten aufgeführten Anmeldungen und falls der Gegenstand aus jedem Anspruch dieser Anmeldung nicht in einer früheren amerikanischen Patentanmeldung laut dem ersten Paragraphen des Absatzes 35 der Zivilprozeßordnung der Vereinigten Staaten, Paragraph 122 offenbart ist, erkenne ich gemäss Absatz 37, Bundesgesetzbuch, Paragraph 1.56(a) meine Pflicht zur Offenbarung von Informationen an, die zwischen dem Anmeldedatum der früheren Anmeldung und dem nationalen oder PCT internationalen Anmeldedatum dieser Anmeldung bekannt geworden sind.

I hereby claim the benefit under Title 35. United States Code. §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §122, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occured between the filing date of the prior application and the national or PCT international filing date of this application.

PCT/DE00/01104	10.04.2000		pending
(Application Serial No.) (Anmeldeseriennummer)	(Filing Date D, M, Y) (Anmeldedatum T, M, J)	(Status) (patentiert, anhängig, aufgegeben)	(Status) (patented, pending, abandoned)
(Application Serial No.) (Anmeldeseriennummer)	(Filing Date D,M,Y) (Anmeldedatum T, M; J)	(Status) (patentiert, anhängig, aufgeben)	(Status) (patented, pending, abandoned)

Ich erkläre hiermit, dass alle von mir in der vorliegenden Erklärung gemachten Angaben nach meinem besten Wissen und Gewissen der vollen Wahrheit entsprechen, und dass ich diese eidesstattliche Erklärung in Kenntnis dessen abgebe, dass wissentlich und vorsätzlich falsche Angaben gemäss Paragraph 1001, Absatz 18 der Zivilprozessordnung der Vereinigten Staaten von Amerika mit Geldstrafe belegt und/oder Gefängnis bestraft werden koennen, und dass derartig wissentlich und vorsätzlich falsche Angaben die Gültigkeit der vorliegenden Patentanmeldung oder eines darauf erteilten Patentes gefährden können.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

German Language Declaration

VERTRETUNGSVOLLMACHT: Als benannter Erfinder beauftrage ich hiermit den nachstehend benannten Patentanwalt (oder die nachstehend benannten Patentanwälte) und/oder Patent-Agenten mit der Verfolgung der vorliegenden Patentanmeldung sowie mit der Abwicklung aller damit verbundenen Geschäfte vor dem Patent- und Warenzeichenamt: *(Name und Registrationsnummer anführen)*

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. *(list name and registration number)*

And I hereby appoint

Customer No. 02292

Telefongespräche bitte richten an: *(Name und Telefonnummer)*

Direct Telephone Calls to: *(name and telephone number)*

Ext. _____

Postanschrift:

Send Correspondence to:

Birch, Stewart, Kolasch & Birch, LLP
8110 Gatehouse Road / Suite 500 East 22042 Falls Church, Virginia
Telephone: +1 703 205 8000 and Facsimile +1 703 205 8050
or
Customer No. 02292

Voller Name des einzigen oder ursprünglichen Erfinders:	Full name of sole or first inventor:
ANDREAS KOCHENBURGER	ANDREAS KOCHENBURGER
Unterschrift des Erfinders Datum: A. Kochenburger 18.9.01	Inventor's signature Date: A. Kochenburger 18.9.01
Wohnsitz: HERXHEIM, DEUTSCHLAND	Residence: HERXHEIM, GERMANY DEX
Staatsangehörigkeit: DEUTSCH	Citizenship: GERMAN
Postanschrift: GEORG-RÖMER-STR. 3 76863 HERXHEIM DEUTSCHLAND	Post Office Addess: GEORG-RÖMER-STR. 3 76863 HERXHEIM GERMANY
Voller Name des zweiten Miterfinders (falls zutreffend):	Full name of second joint inventor, if any:
Unterschrift des Erfinders Datum	Second Inventor's signature Date
Wohnsitz ,	Residence ,
Staatsangehörigkeit	Citizenship
Postanschrift	Post Office Address

(Bitte entsprechende Informationen und Unterschriften im Falle von dritten und weiteren Miterfindern angeben).

(Supply similar information and signature for third and subsequent joint inventors).

PATENT
32860-000183

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: Andreas KOCHENBURGER

Int'l Application No.: PCT/DE00/01104

Application No.: **NEW**

Filed: October 22, 2001

For: METHOD OF KEEPING A CHECK ON THE COSTS ARISING DURING THE OPERATION OF AN INSTALLATION

CHANGE OF ADDRESS AND REVOCATION AND SUBSTITUTION OF POWER OF ATTORNEY

Hon. Commissioner of Patents and Trademarks
Washington, D.C. 20231

October 22, 2001

Sir:

Under 37 C.F.R. § 3.73(b), the undersigned hereby states that the below-named Assignee is an assignee in the above-identified Application:

Assignee: **SIEMENS AKTIENGESELLSCHAFT**

The documentary evidence of a chain of title from the original owner to the Assignee is provided in the Assignment Document(s):

☒ filed herewith,

☐ previously filed,

Reel No. _____, Frame No. _____.

I hereby declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further that these statements are made with the knowledge that willful false statements, and the like so made, are punishable by fine or imprisonment, or both, under Section 1001, Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

POWER OF ATTORNEY

The Declaration submitted along with this application includes a Power of Attorney listing the attorneys of Birch, Stewart, Kolasch & Birch, LLP. Please hereby revoke the aforementioned attorneys and substitute the attorneys of Customer No. 30596, including the following attorneys of Harness, Dickey & Pierce, P.L.C., to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

Terry L. Clark	Registration No. 32,644
Donald J. Daley	Registration No. 34,313
John A. Castellano	Registration No. 35,094
Gary D. Yacura	Registration No. 35,416
Thomas S. Auchterlonie	Registration No. 37,275
Timothy R. Wyckoff	Registration No. 46,175

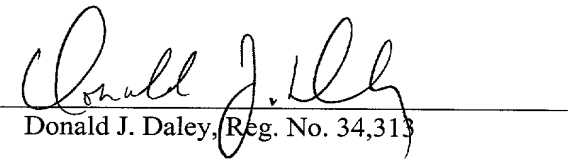
CORRESPONDENCE ADDRESS

I request the Patent and Trademark Office to direct all correspondence and telephone calls relative to this application to Customer No. 30596, Harness, Dickey & Pierce, P.L.C., P.O. Box 8910, Reston, Virginia 20195, (703) 390-3030.

The undersigned is empowered with full Power of Attorney on behalf of the assignee.

Respectfully submitted,

HARNESS, DICKEY & PIERCE, P.L.C

By: 
Donald J. Daley, Reg. No. 34,313

P.O. Box 8910
Reston, Virginia 20195
(703) 390-3030

DJD:kna